

ANNOUNCEMENTS

Milestones in Service

Several staff members were honored recently for achieving milestones in their years of service with the federal government (certificates and pins) or CIRES (newly-designed certificates). Receiving recognition at the Aeronomy Lab's October meeting were:

40 yrs:	Dick Norton	10 yrs:	Jim Burkholder
35 yrs:	Carl Love		Kathy Green
30 yrs:	Wally Clark		Eirh-Yu Hsie
25 yrs:	Carl Howard		Gerd Hübler
	Rich McLaughlin		Stu McKeen
20 yrs:	Ken Gage		Adrian Tuck
	Irene DeDe		Eric Williams
15 yrs:	Paul Murphy		Robert Wilson
	Mike Proffitt		
	Tony Riddle		



Thanks for the Flower Beds



The Aeronomy Lab flower beds were once again a dazzling display, delightful to the eyes, noses, and souls of all of us. A big THANK YOU to **Donna Sueper** and **Barbara Herrli** for sharing their green-thumb expertise. We all appreciate your hard work!

Publications *T r a c k i n g*

The Director's Office recently announced a new publications reporting procedure that we hope you are all finding easy to follow. Group secretaries have a supply of blank forms (there's now one and only one form to fill out) and can help with questions. Please be sure to use the process for any paper, proceedings contribution, technical report, article, book, or book chapter that you are submitting for publication. Thanks for your help!



The Envelope Please...



David Fahey received a Department of Commerce Silver Medal for *"initiative and leadership in making the first direct measurements of supersonic aircraft emissions and then analyzing the atmospheric implications."* The exhaust gases and particles of an in-flight supersonic Air France Concorde were sampled by instruments onboard the NASA ER-2 high altitude research aircraft in 1994. David coordinated an international team of scientists, pilots, and air traffic controllers who accomplished the difficult feat. The Silver Medal will be presented to David at a ceremony on 4 December in Washington, DC.

Jeff Hicke has been awarded an Environmental Fellowship from the U.S. Environmental Protection Agency. The 3-year fellowship will help to support Jeff's doctoral research in the Meteorological Chemistry Program, where he is doing model studies of chemical and meteorological data from aircraft missions to the polar and midlatitude stratosphere.

Susan Solomon was twice-honored in recent months. In October, she received a Stratospheric Ozone Protection Award from the U.S. EPA. The award cites Susan *"for personal initiative in the study of stratospheric chemistry and the acceptability of alternatives to ozone depleting substances."* Earlier in 1996, Susan was presented with an honorary doctor of science degree from Williams College.

Yinon Rudich has received the Sir Charles Clore Prize from the Weizmann Institute in Israel. The award is made annually by faculty of the Institute to a promising new recruit. Yinon, who will leave the Aeronomy Lab at the end of 1996 to take a position at the Institute, will be able to use the stipend of the Clore Prize in his research there.

Dan Albritton's 1968 doctoral-thesis paper was recently cited in a commemorative volume of the *Physical Review*. The journal identified a set of its papers that had been most influential in physics over its century of publication: 1895-1995. Dan's paper described a new experimental method for studying how electrically charged particles interact with neutral molecules.

The Aeronomy Lab garnered two of the six Outstanding Scientific Paper awards in the "research paper" category of the NOAA Environmental Research Laboratories' annual competition:

A.R. Ravishankara, A.A. Turnipseed, N.R. Jensen, S. Barone, M. Mills, C.J. Howard, and S. Solomon, Do hydrofluorocarbons destroy stratospheric ozone?, *Science*, 263, 171-175, 1994.

G.C. Reid, Seasonal and interannual temperature variations in the tropical stratosphere, *J. Geophys. Res.*, 99, 18923-18932, 1993.

DIAL-ing It in at the Fritz Peak Observatory

A decade ago, Mike Proffitt did some detailed theoretical work to explore the possibility of using differential absorption lidar (DIAL) to probe ozone in the troposphere. Today, those ideas are reality — in the form of the Rapid Tunable Daylight (RTD) DIAL instrument, operated by Mike, Andy Langford, Chris Masters, and Ken Aiken at the Fritz Peak Observatory an hour west of Boulder near Rollinsville.

Unlike any other instrument in use today, the Fritz Peak DIAL can obtain profiles of ozone at 1-km height resolution every few minutes, from an altitude of about 4 km above sea level up to the lower stratosphere (about 12 to 16 km depending on season). With that kind of spatial and temporal resolution, it's almost as if Mike, Andy, and colleagues are making a "movie" of the ozone over Fritz Peak. And while there are other ground-based DIAL configurations that look at ozone in the boundary layer or in the stratosphere, the Fritz Peak DIAL is the only instrument that can profile the entire "free troposphere" during day or night.

Therein lies the source of many challenges posed by the project to make the Fritz Peak DIAL. In measuring over that distance, the instrument needs to span 8 orders of magnitude in signal intensity. That dynamic range makes extraordinary demands upon the lasers, digitizers, and other equipment that go into making the DIAL instrument. While in most applications a digitizer or photomultiplier tube may appear to behave linearly, it's "not so when you push for a range of 10^8 ," says Andy.

After about 5 years of research and development (including a schedule interruption forced by the discovery of the ozone hole and Mike's subsequent

participation in associated field campaigns), the Fritz Peak DIAL has been in regular operation since about 1993. The scientists gather ozone data during daylight hours when the sky is clear — which usually means about 100 days of the year. Along with the ozone measurements, tropospheric aerosol profiles are obtained by using visible wavelengths (ultraviolet is used for ozone).

Scientific objectives fall into two major categories: the characterization of ozone variability and trends on seasonal and longer timescales, and the study of short-term ozone variability and specific events relating to stratosphere-troposphere exchange. Observation of one of those special events, a tropopause fold in October of 1995, is the subject of a recent paper by the group and was featured in a talk that Andy gave at the XVIII Quadrennial Ozone Symposium in L'Aquila, Italy, last September. The data were used to calculate the flux of ozone transferred to the troposphere during the event. Two more papers, written with Tom VanZandt of the Atmospheric Dynamics Program and J.-F. Lamarque of NCAR, show how gravity waves can perturb tropospheric ozone and mix ozone from the stratosphere into the troposphere. While this type of event occurs on a much smaller spatial scale and leads to a much smaller flux from the stratosphere (50 times less, in these specific cases), it likely occurs more frequently than tropopause folding and could be an important mechanism for stratosphere-troposphere exchange in some areas.

Future plans call for continued studies of short-term events, along with the statistical and scientific analyses of the features in four years of archived data.



HOME and AWAY

WB-57 Update

An in-flight mechanical failure onboard the WB-57F high-altitude research aircraft on 26 August, along with other operational and maintenance issues, have put a temporary "hold" on the aircraft's inaugural science flights. This development means that Aeronomy Lab scientists in the Meteorological Chemistry Program (Adrian Tuck, Mike Proffitt, Ken Kelly, Erik Richard, Dan Murphy, Mike Schein, and David Thomson) are currently looking into other near-term ways to get their instruments (for measuring ozone, methane, water vapor, and particle composition) into the air. This includes the possibility of flights on the "other" WB-57, the U.S. Air Force/NASA aircraft based at Johnson Space Flight Center in Houston. The new near infrared diode laser instrument for methane will fly on this aircraft on 19 December, as part of an Aerospace Corporation investigation on behalf of the USAF of the chemical composition of rocket plumes. ♣

German Delegation Visits the Aeronomy Lab

In September, scientists in the Tropospheric Chemistry and Theoretical Aeronomy Programs briefed several of Germany's federal and state air pollution control officials on the Aeronomy Lab's scientific research on air quality. A full morning of presentations, coordinated by Fred Fehsenfeld, discussed the regionality of the ozone problem (Michael Trainer), point versus regional sources of ozone precursors (Tom Ryerson), and hydrocarbon versus nitrogen oxides control strategies (Michael, Paul Goldan, Jim Roberts). Germany's size and location make it vulnerable to cross-boundary transport of air pollution and pollutant precursors, a point that was driven home by a viewgraph showing that the country is roughly the same size as the region investigated during the 1995 Nashville/Middle Tennessee Ozone Study. The visitors hope to use the findings of the Aeronomy Lab and other institutions of the U.S. in crafting Germany's air quality plan. ♣

The Montreal Protocol: Altering the Odds of Skin Cancer

What would have happened to the skin cancer incidence, in the U.S. and Europe, if world leaders had not acted to restrict ozone-depleting halocarbon emissions?

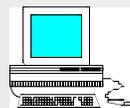
The Aeronomy Lab's John Daniel has teamed up with researchers in the Netherlands to answer that question in a paper that appears in the November 21 issue of *Nature*. The researchers developed a robust method of integrating rates of future skin cancer cases, ozone depletion, and ozone recovery, and used it to predict what conditions would be if there were "no restrictions," if only the original 1985 Montreal Protocol were fully implemented, and if the Montreal Protocol and the strengthening provisions of the 1992 Copenhagen Amendments were fully implemented.

The importance of both the Montreal Protocol and the Copenhagen Amendments is remarkably demonstrated in this study. Indeed, model results show there would be a runaway increase in skin cancer incidence with both the "no restrictions" scenario and the "original Montreal Protocol" scenario. By the year 2100, for example, the annual skin cancer rate would have quadrupled under the "no restrictions" scenario and doubled under the Montreal Protocol, increasing thereafter in each case. Only implementation of both the Montreal Protocol *and* the Copenhagen Amendments leads to an ozone minimum in the year 2000. Even so, the model shows that we can expect nearly a 10% increase in annual skin cancer cases, peaking in the year 2060 — a delay of 60 years from the time of greatest UV exposure.

The estimates are very conservative for three reasons. The assumed rate of increase in the production of ozone-depleting substances is lower in the model than that observed in the mid-1980s. Higher occurrences of ozone depletion in most recent years (possibly influenced in the short term by the volcanic eruption of Mt. Pinatubo in 1991) were not taken into account. If those higher depletions were to continue into the future, they would increase the excess incidence and mortality estimates by 20-40%. Finally, the aging of the population (not taken into account) over the next 50 years would increase excess risks caused by ozone depletion. A separate analysis for the Netherlands that accounted for aging showed a doubling of skin cancer by the year 2040.

Currently each year in the U.S., two thousand of every million people contract various forms of skin cancer from all causes. Europeans are subject to half of that amount using incidence records from the Netherlands as a representative sample. The study by Daniel and colleagues shows that even with absolute global compliance with the Copenhagen Amendments, we face having 47,000 excess skin cancer cases per year in the U.S. and Europe around the year 2050 because of ozone depletion.

-Terry Cookro



Bits On Computing

The Computing and Networking Resources Group is pleased to announce that our group Web page is ready for your use! It contains a wealth of information on the Lab's computing resources (hardware and software), answers to frequently asked "how do I do this..." questions, and guidelines for getting assistance from CNRG when you've come upon a problem that the new Web page does not address. Please consult the page *first*; it will be to your advantage, since the three of us cannot always be so readily accessible. From the AL home page (<http://www.al.noaa.gov>), choose "Our People and Our Facilities"; near Walt's listing you will see the link to "Computing and Networking Resources." Please add it to your bookmarks!!! Suggestions to webmaster@al.noaa.gov for modifications and/or additions are always welcome.

—Walt, Cathy, and Jenny



WHAT'S UP WITH PEOPLE

Susan Solomon returned on 1 November after a one-year sabbatical, during which she was Acting Director of the Atmospheric Chemistry Division at NCAR. We welcome her back... **Terry Cookro** is the new assistant for the Middle Atmosphere and Theoretical Aeronomy Programs. Her background is in geology, and she was most recently with the U.S. Geological Survey in Denver... After 15 years with the Aeronomy Lab, **Tony Riddle** will retire in early 1997. Tony has been responsible for management of wind profiler data in the Tropical Dynamics and Climate Program; he also was the first CIRES employee of the Aeronomy Lab... **Jason Hoskins** has joined the tropical climate group to work with the wind profiler data. He is a student at CU... In the Atmospheric Chemical Kinetics Program, **Joost de Gouw** will conduct postdoctoral work on ion chemistry and reactions of peroxy radicals. He received a Ph.D. from the University of Utrecht in the Netherlands and was most recently a postdoc at the Joint Institute for Laboratory Astro-physics at CU... Three members of the kinetics group will be leaving for other positions. **Matthew Harwood** will leave in November to work with Royal Shell; **Frédérique Battin-LeClerc** will return to the CNRS in Nancy, France, after her one-year visit at the Aeronomy Lab; and **Yinon Rudich** will leave at the end of the year to work at the Weizmann Institute in Israel... **Karl Knapp** is a CU graduate student who has begun work with the Tropospheric Chemistry Program, where he is developing instrumentation to measure nitrogen oxides... **Jonathan Williams** is leaving the Tropospheric Chemistry Program in January to return to England, where he'll continue

his research... **George Mount** is working part time on radiation science at the Laboratory for Atmospheric and Space Physics... **Jim Brault** has begun a new position with the CU Chemistry Department, where he is working on laboratory and field projects involving Fourier transform spectroscopy. We wish the best for everyone's new endeavors, whether here or elsewhere.



COMMUNICATING OUR SCIENCE

To Decisionmakers: Carl Howard reported the findings of a draft chapter, entitled "Air Quality Effects of the Winter Oxyfuel Program," on August 26 to the Colorado Air Quality Control Commission, which administers the oxyfuels program for Colorado. Carl is a lead author and coordinator of the chapter, which is part of the Interagency Oxygenated Fuel Assessment being coordinated by the White House Office of Science and Technology Policy... Dan Albritton was one of eight invited speakers at an Aspen Institute Conference on climate change in Lisbon, Portugal, in November. Conducted in a "round-table" format to encourage discussion, the event involved 15 U.S. Senators and Representatives. Dan described the scientific knowns and unknowns on the topic and fielded many questions from the group... The Aeronomy Lab hosted a visit of Under Secretary of State for Global Affairs Tim Wirth in October. Several scientists from NOAA-Boulder organizations and CIRES participated in the one-hour discussion on the linkages between U.S. foreign policy and global environmental issues.

To the Scientific Community: On 1 February, a special issue of *Journal of Geophysical Research* will feature 25 papers discussing the results of the 1993 Tropospheric OH Photochemistry Experiment. George Mount served as guest editor of the issue.

To Media and the Public: Gerd Hübler and Barbara McGehan (NOAA-Boulder Public Affairs Officer) coordinated the visit of journalists from the Weather Channel to the Aeronomy Lab and the WP-3D aircraft during the STERAO field campaign this summer. A segment of several minutes in length aired in mid-September. See Gerd or Chris Ennis if you'd like to view the tape. The Discovery Channel is also expected to feature the STERAO mission in an upcoming segment.

To Students and Teachers: Ann Middlebrook has co-authored (with Maggie Tolbert of CU/CIRES) a teaching module for undergraduate non-science majors. *Stratospheric Ozone Depletion* is the latest in a series of such modules in the Global Change Instruction Program of UCAR/NCAR.

To Constituents: Susan Solomon is serving on a National Science Foundation panel that is studying how to achieve cost savings in the Antarctic research program... Ravi is a member of a National Academy of Sciences Panel that is looking into replacements for halon uses in the U.S. Navy.

To Our Visitors: Chris Ennis and Cathy Burgdorf prepared an Aeronomy Lab poster presentation that was displayed during the luncheon following the NOAA new-building groundbreaking ceremony on October 18. Congressman David Skaggs, Boulder Mayor Leslie Durgin, NOAA Deputy Under Secretary Diana Josephson, Acting OAR Assistant Administrator Alan Thomas, ERL Director Jim Rasmussen, and others attended the event.



DOWN THE ROAD

Dec. 2-6: First SPARC (Stratospheric Processes and Their Role in Climate) General Assembly of the World Climate Research Programme, held in Melbourne, Australia. Susan Solomon and Ravi are invited speakers; other Aeronomy Lab scientists will present talks and posters.

Dec. 2-20: Another deployment of the Stratospheric Tracers of Atmospheric Transport (STRAT) experiment; based in Barbers Point, Hawaii, and NASA Ames Research Center in California.



Dec. 13: Aeronomy Laboratory Holiday Open House, 2-4 p.m., Room 0113 of Building 2.



Dec. 16-20: Fall Meeting, American Geophysical Union. Among the Aeronomy Lab contributions will be participation in four special sessions: one on the 1995 Nashville/Middle Tennessee Ozone Study (organized by Fred Fehsenfeld); a session on inter-comparison of formaldehyde measurement techniques; a session on the First International Global Atmospheric Chemistry (IGAC) Aerosol Characterization Experiment (ACE-1); and a CO/O₃ correlations special session.

Jan. 21: Alex Weaver and John Daniel will travel to McMurdo Station, Antarctica, to retrieve the OCIO/NO₂ spectrometer that the Middle Atmosphere Program has operated since 1991.

Seminar Series Continues: Here are the talks scheduled for the upcoming quarter of the Aeronomy Lab's seminar series, all on Wednesdays at 3:30 p.m. in Room 0113 of Building 2:

- Dec. 4 - Jonathan Williams, (AL/CIRES)
- Jan. 8 - Ned Lovejoy (AL)
- Jan. 15 - Cindy Nevison (AL)
- Jan. 22 - Ru-Shan Gao (AL/CIRES)
- Feb. 5 - Ed Dlugokencky (NOAA - CMDL)
- Feb. 19 - Eric Keim (AL/CIRES)

(See the Aeronomy Lab's Website for schedule updates.)

On the Air! is a quarterly publication of the NOAA Aeronomy Laboratory. Please send any comments, questions, and suggestions to: Chris Ennis (phone 303-497-7538; email cennis@al.noaa.gov).

